AMENDMENTS TO THE CLAIMS

1.   (currently amended):   A method of automatically re-provisioning a network element in adaptation to a failure, the method comprising the computer-implemented steps of:

identifying a network element that has failed;

a cluster manager selecting a substitute network element from among a pool of one or more available network elements to replace the specific network element identified as failing;

the cluster manager receiving connection configuration information from the identified specific network element identified as failing; [[and]]

wherein the cluster manager is communicatively coupled to a cluster comprising a plurality of active network elements, the pool of one or more available network elements, a first network switch, and a second network switch;

based on the connection configuration information, the cluster manager re-configuring the substitute network element and one or more switch devices associated with the identified network element, wherein the re-configuring causes the one or more switch devices to change one or more connections from the identified network element to the substitute network element;

wherein the steps are performed by a cluster manager that is communicatively coupled to a cluster comprising a plurality of active network elements, the pool of one or more available network elements, a first network switch, and a second network switch

the cluster manager managing a plurality of connection objects corresponding to the number of subscribers in the network;

wherein a connection object comprises a programmatic object that points to a fixed defined set of templates and contains attributes providing specific substitution values to be used when instantiating the templates into actual configurations; and

the cluster manager logically re-associating all of the plurality of connection objects of the specific network element identified as failing with the new network element selected from the pool of available substitute network elements.

2. (currently amended) The method as recited in Claim 1, wherein the specific ~~identified~~ network element identified as failing is one of a plurality of network elements in [[a]] the cluster ~~that is associated with the first and second network switches~~.

3. (cancelled)

4. (previously presented) The method as recited in Claim 1, wherein the step of re-configuring comprises the steps of sending a trigger event to the substitute network element that causes the substitute network element to retrieve a configuration over a network connection.

5. (previously presented) The method as recited in Claim 1, wherein re-configuring comprises dynamically reconfiguring the selected network element as a logical clone of the identified network element.

6. (previously presented) The method as recited in Claim 1, further comprising the step of associating the identified network element with the pool of available network elements.

7. (previously presented) The method as recited in Claim 1, further comprising the steps of:

sending an initial configuration to the substitute network element;

sending a partial accumulated configuration to the substitute network element; and

sending instructions that cause the identified network element to reboot based on a

configuration setting of a cluster associated with the identified network

element.

8.   (previously presented) The method as recited in Claim 1, further comprising the steps

of:

receiving first user input in a graphical user interface that associates the network

elements in a cluster with a first switch and a second switch;

receiving second user input that specifies which network elements are reserved in the

pool of available network elements.

9.   (previously presented) The method as recited in Claim 1, wherein each of the network

elements is a network aggregation device or a network access server.

10.   (previously presented) The method as recited in Claim 1, further comprising repeating

the steps for multiple concurrently failed network elements.

11.   (previously presented) The method as recited in Claim 1, further comprising the steps

of:

receiving a message specifying a failure of a network element over an event bus on

which the network elements publish events and on which a cluster manager

subscribes to events;

based on the message, identifying the network element that has failed.

12.   (previously presented) The method as recited in Claim 1, wherein the network

switches are asynchronous transfer mode (ATM) switches, and wherein the network

elements are routers in a packet-switched network.

13.   (currently amended) A method of automatically re-provisioning a network element in

adaptation to a failure, the method comprising the computer-implemented steps of:

receiving first user input that defines a cluster comprising a first network switch, a

      plurality of network elements, and a second network switch;

receiving second user input that specifies one or more of the network elements as a

      pool of available network elements;

identifying a network element that has failed;

selecting a substitute network element from among the pool; and

re-configuring the first network switch and the second network switch, wherein the

      re-configuring causes the first network switch and second network switch to

      change one or more connections from the identified network element to the

      substitute network element

wherein the steps are performed by a cluster manager that is communicatively

      coupled to a cluster comprising a plurality of active network elements, the

      pool of one or more available network elements, the first network switch, and

      the second network switch;

the cluster manager managing a plurality of connection objects corresponding to the

      number of subscribers in the network;

wherein a connection object comprises a programmatic object that points to a fixed

      defined set of templates and contains attributes providing specific substitution

      values to be used when instantiating the templates into actual configurations;

      and

the cluster manager logically re-associating all of the plurality of connection objects

      of the specific network element identified as failing with the substitute

<u>network elements selected from the pool of available substitute network</u>

<u>elements</u>.

14.   (previously presented) The method as recited in Claim 13, wherein the step of re-configuring comprises the steps of sending a trigger event to the substitute network element that causes the substitute network element to retrieve a configuration over a network connection.

15.   (previously presented) The method as recited in Claim 13, wherein re-configuring comprises dynamically reconfiguring the selected network element as a logical clone of the identified network element.

16.   (previously presented) The method as recited in Claim 13, further comprising the step of associating the identified network element with the pool of available network elements.

17.   (previously presented) The method as recited in Claim 13, further comprising the steps of:

sending an initial configuration to the substitute network element;

sending a partial accumulated configuration to the substitute network element; and

sending instructions that cause the identified network element to reboot based on a

        configuration setting of a cluster associated with the identified network

        element.

18.   (previously presented) The method as recited in Claim 13, wherein each of the network elements is a network aggregation device or a network access server.

19.   (previously presented) The method as recited in Claim 13, further comprising repeating the steps for multiple concurrently failed network elements.

20.   (previously presented) The method as recited in Claim 13, further comprising the

steps of:

receiving a message specifying a failure of a network element over an event bus on

which the network elements publish events and on which a cluster manager

subscribes to events;

based on the message, identifying the network element that has failed.

21.   (previously presented) The method as recited in Claim 13, wherein the network

switches are asynchronous transfer mode (ATM) switches, and wherein the network

elements are routers in a packet-switched network.

22.   (currently amended) A computer-readable medium storing one or more sequences of

instructions for automatically re-provisioning a network element in adaptation to a

failure, which instructions, when executed by one or more processors, cause the one

or more processors to carry out the steps of:

identifying a network element that has failed;

a cluster manager selecting a substitute network element from among a pool of one or

more available network elements to replace the specific network element

identified as failing;

the cluster manager receiving connection configuration information from the

identified specific network element identified as failing; [[and]]

wherein the cluster manager is communicatively coupled to a cluster comprising a

plurality of active network elements, the pool of one or more available

network elements, a first network switch, and a second network switch;

based on the connection configuration information, the cluster manager re-

configuring the substitute network element and one or more switch devices

associated with the identified network element, wherein the re-configuring causes the one or more switch devices to change one or more connections from the identified network element to the substitute network element;

~~wherein the steps are performed by a cluster manager that is communicatively coupled to a cluster comprising a plurality of active network elements, the pool of one or more available network elements, a first network switch, and a second network switch~~

the cluster manager managing a plurality of connection objects corresponding to the number of subscribers in the network;

wherein a connection object comprises a programmatic object that points to a fixed defined set of templates intended to be applied to a stack device and adjacent switches, and contains attributes providing specific substitution values to be used when instantiating the templates into actual configurations; and

the cluster manager logically re-associating all of the plurality of connection objects of the specific network element identified as failing with the new network element selected from the pool of available substitute network elements.

23.   (previously presented) The computer-readable medium as recited in Claim 22, wherein the identified network element is one of a plurality of network elements in a cluster that is associated with first and second network switches.

24.   (cancelled)

25.   (previously presented) The computer-readable medium as recited in Claim 22, wherein the instructions for re-configuring further comprise instructions for sending a trigger event to the substitute network element that causes the substitute network element to retrieve a configuration over a network connection.

26.   (previously presented) The computer-readable medium as recited in Claim 22, wherein the instructions for re-configuring further comprise instructions for dynamically reconfiguring the selected network element as a logical clone of the identified network element.

27.   (previously presented) The computer-readable medium as recited in Claim 22, further comprising instructions for associating the identified network element with the pool of available network elements.

28.   (previously presented) The computer-readable medium as recited in Claim 22, further comprising instructions for:

sending an initial configuration to the substitute network element;

sending a partial accumulated configuration to the substitute network element; and

sending instructions that cause the identified network element to reboot based on a
        configuration setting of a cluster associated with the identified network
        element.

29.   (previously presented) The computer-readable medium as recited in Claim 22, further comprising instructions for:

receiving first user input in a graphical user interface that associates the network
        elements in a cluster with a first switch and a second switch;

receiving second user input that specifies which network elements are reserved in the
        pool of available network elements.

30.   (previously presented) The computer-readable medium as recited in Claim 22, wherein each of the network elements is a network aggregation device or a network access server.

31.   (previously presented) The computer-readable medium as recited in Claim 22, further

comprising instructions for repeatedly executing the instructions for multiple

concurrently failed network elements.

32.   (previously presented) The computer-readable medium as recited in Claim 22, further

comprising instructions for performing the steps of:

receiving a message specifying a failure of a network element over an event bus on

   which the network elements publish events and on which a cluster manager

   subscribes to events;

based on the message, identifying the network element that has failed.

33.   (previously presented) The computer-readable medium as recited in Claim 22,

wherein the network switches are asynchronous transfer mode (ATM) switches, and

wherein the network elements are routers in a packet-switched network.

34.   (currently amended) An apparatus for automatically re-provisioning a network

element in adaptation to a failure, comprising:

means for identifying a network element that has failed;

means for selecting a substitute network element from among a pool of one or more

   available network elements to replace the specific network element identified

   as failing;

means for receiving connection configuration information from the ~~identified~~ specific

   network element identified as failing; and

means for re-configuring the substitute network element and one or more switch

   devices associated with the identified network element, based on the

   connection configuration information, wherein the re-configuring causes the

one or more switch devices to change one or more connections from the
identified network element to the substitute network element; and

a cluster manager that is communicatively coupled to a cluster comprising the failed
and substitute network elements and the one ore more switch devices;

the cluster manager managing a plurality of connection objects corresponding to the
number of subscribers in the network;

wherein a connection object comprises a programmatic object that points to a fixed
defined set of templates intended to be applied to a stack device and adjacent
switches, and contains attributes providing specific substitution values to be
used when instantiating the templates into actual configurations; and

the cluster manager logically re-associating all of the plurality of connection objects
of the specific network element identified as failing with the new network
element selected from the pool of available substitute network elements.

35.   (previously presented) The apparatus as recited in Claim 34, wherein the identified
network element is one of a plurality of network elements in a cluster that is
associated with first and second network switches.

36.   (cancelled)

37.   (previously presented) The apparatus as recited in Claim 34, wherein the re-
configuring means comprises means for sending a trigger event to the substitute
network element that causes the substitute network element to retrieve a configuration
over a network connection.

38.   (previously presented) The apparatus as recited in Claim 34, wherein the re-
configuring means comprises means for dynamically reconfiguring the selected
network element as a logical clone of the identified network element.

39.   (previously presented) The apparatus as recited in Claim 34, further comprising means for associating the identified network element with the pool of available network elements.

40.   (previously presented) The apparatus as recited in Claim 34, further comprising:

means for sending an initial configuration to the substitute network element;

means for sending a partial accumulated configuration to the substitute network element; and

means for sending instructions that cause the identified network element to reboot based on a configuration setting of a cluster associated with the identified network element.

41.   (previously presented) The apparatus as recited in Claim 34, further comprising:

means for receiving first user input in a graphical user interface that associates the network elements in a cluster with a first switch and a second switch;

means for receiving second user input that specifies which network elements are reserved in the pool of available network elements.

42.   (previously presented) The apparatus as recited in Claim 34, wherein each of the network elements is a network aggregation device or a network access server.

43.   (previously presented) The apparatus as recited in Claim 34, further comprising means for using the other means repeatedly for multiple concurrently failed network elements.

44.   (previously presented) The apparatus as recited in Claim 34, further comprising:

means for receiving a message specifying a failure of a network element over an event bus on which the network elements publish events and on which a cluster manager subscribes to events;

means for identifying the network element that has failed, based on the message.

45. (previously presented) The apparatus as recited in Claim 34, wherein the network switches are asynchronous transfer mode (ATM) switches, and wherein the network elements are routers in a packet-switched network.

46. (currently amended) An apparatus for automatically re-provisioning a network element in adaptation to a failure, comprising:

a network interface that is coupled to the data network for receiving one or more packet flows therefrom;

a processor;

one or more stored sequences of instructions which, when executed by the processor, cause the processor to carry out the steps of:

identifying a network element that has failed;

a cluster manager selecting a substitute network element from among a pool of one or more available network elements to replace the specific network element identified as failing;

the cluster manager receiving connection configuration information from the identified specific network element identified as failing; and

based on the connection configuration information, the cluster manager re-configuring the substitute network element and one or more switch devices associated with the identified network element, wherein the re-configuring causes the one or more switch devices to change one or more connections from the identified network element to the substitute network element;

~~wherein the steps are performed by a cluster manager that is communicatively~~

~~coupled to a cluster comprising the failed and substitute network elements and~~

~~the one or more switch devices~~

the cluster manager managing a plurality of connection objects corresponding to the

number of subscribers in the network;

wherein a connection object comprises a programmatic object that points to a fixed

defined set of templates intended to be applied to a stack device and adjacent

switches, and contains attributes providing specific substitution values to be

used when instantiating the templates into actual configurations; and

the cluster manager logically re-associating all of the plurality of connection objects

of the specific network element identified as failing with the new network

element selected from the pool of available substitute network elements.

47.   (currently amended) The method as recited in Claim 1, wherein the specific ~~identified~~

network element identified as failing is one of a plurality of network elements in [[a]]

the cluster ~~that is associated with the first and second network switches~~.

48.   (cancelled)

49.   (previously presented) The apparatus as recited in Claim 46, wherein the step of re-

configuring comprises the steps of sending a trigger event to the substitute network

element that causes the substitute network element to retrieve a configuration over a

network connection.

50.   (previously presented) The apparatus as recited in Claim 46, wherein re-configuring

comprises dynamically reconfiguring the selected network element as a logical clone

of the identified network element.

51.   (previously presented) The apparatus as recited in Claim 46, further comprising the
        step of associating the identified network element with the pool of available network
        elements.

52.   (previously presented) The apparatus as recited in Claim 46, further comprising the
        steps of:
        sending an initial configuration to the substitute network element;
        sending a partial accumulated configuration to the substitute network element; and
        sending instructions that cause the identified network element to reboot based on a
            configuration setting of a cluster associated with the identified network
            element.

53.   (previously presented) The apparatus as recited in Claim 46, further comprising the
        steps of:
        receiving first user input in a graphical user interface that associates the network
            elements in a cluster with a first switch and a second switch;
        receiving second user input that specifies which network elements are reserved in the
            pool of available network elements.

54.   (previously presented) The apparatus as recited in Claim 46, wherein each of the
        network elements is a network aggregation device or a network access server.

55.   (previously presented) The apparatus as recited in Claim 46, further comprising
        repeating the steps for multiple concurrently failed network elements.

56.   (previously presented) The apparatus as recited in Claim 46, further comprising the
        steps of:

receiving a message specifying a failure of a network element over an event bus on

which the network elements publish events and on which a cluster manager

subscribes to events;

based on the message, identifying the network element that has failed.

57.   (previously presented) The apparatus as recited in Claim 46, wherein the network

switches are asynchronous transfer mode (ATM) switches, and wherein the network

elements are routers in a packet-switched network.

58-60. (cancelled)

61.   (previously presented) The method as recited in Claim 1, further comprising:

a switch adjacent to a failing node sending an event on an event bus indicating that an

interface on a failing switch is no longer active.

62.   (previously presented) The method as recited in Claim 61, further comprising:

the cluster manager receiving notification of the event and identifying a node that has

failed.

63.   (currently amended) The method as recited in Claim [[63]] 62, further comprising:

the cluster manager correlating an interface on the failing ~~switch~~ node to a specific

stack element.

64.   (currently amended) The method as recited in Claim 1, further comprising:

the cluster manager using a keepalive or heartbeat protocol ~~against~~ to determine the

status of a plurality of stack elements.

65.   (previously presented) The method as recited in Claim 1, further comprising:

the cluster manager searching for a device in the free pool that is available for use as

a fail-over device.

66.   (currently amended) A method of automatically re-provisioning a network element in
      adaptation to a failure, the method comprising the computer-implemented steps of:

      a cluster manager identifying a network element that has failed;

      the cluster manager selecting a substitute network element from among a pool of one
            or more available network elements to replace the specific network element
            identified as failing;

      the cluster manager receiving connection configuration information from the
            identified specific network element identified as failing; and

      based on the connection configuration information, the cluster manager re-
            configuring the substitute network element and one or more switch devices
            associated with the identified network element, wherein the re-configuring
            causes the one or more switch devices to change one or more connections
            from the identified network element to the substitute network element;

      wherein the step of re-configuring comprises the steps of sending a trigger event to
            the substitute network element that causes the substitute network element to
            retrieve [[a]] configuration information over a network connection;

      the cluster manager managing a plurality of connection objects corresponding to the
            number of subscribers in the network;

      wherein a connection object comprises a programmatic object that points to a fixed
            defined set of templates and contains attributes providing specific substitution
            values to be used when instantiating the templates into actual configurations;
            and

the cluster manager logically re-associating all of the plurality of connection objects

of the specific network element identified as failing with the new network

element selected from the pool of available substitute network elements.

67.   (currently amended) A method of automatically re-provisioning a network element in

adaptation to a failure, the method comprising the computer-implemented steps of:

a cluster manager identifying a network element that has failed;

the cluster manager selecting a substitute network element from among a pool of one

or more available network elements to replace the specific network element

identified as failing;

the cluster manager receiving connection configuration information from the

identified specific network element identified as failing; and

based on the connection configuration information, the cluster manager re-

configuring the substitute network element and one or more switch devices

associated with the identified network element, wherein the re-configuring

causes the one or more switch devices to change one or more connections

from the identified network element to the substitute network element;

wherein re-configuring comprises dynamically reconfiguring the selected network

element as a logical clone of the identified network element;

the cluster manager managing a plurality of connection objects corresponding to the

number of subscribers in the network;

wherein a connection object comprises a programmatic object that points to a fixed

defined set of templates intended to be applied to a cluster, and contains attributes

providing specific substitution values to be used when instantiating the templates

into actual configurations; and

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when failover occurs, the cluster manager logically re-associating all of the plurality of connection objects of the specific network element identified as failing with the new network element selected from the pool of available substitute network elements.

68. (currently amended) A method of automatically re-provisioning a network element in adaptation to a failure, the method comprising the computer-implemented steps of:

a cluster manager identifying a network element that has failed;

the cluster manager selecting a substitute network element from among a pool of one or more available network elements to replace the specific network element identified as failing;

the cluster manager receiving connection configuration information from the ~~identified~~ specific network element identified as failing; and

based on the connection configuration information, re-configuring the substitute network element and one or more switch devices associated with the identified network element, wherein the re-configuring causes the one or more switch devices to change one or more connections from the identified network element to the substitute network element;

sending an initial configuration to the substitute network element;

sending a partial accumulated configuration to the substitute network element; and

sending instructions that cause the identified network element to reboot based on a configuration setting of a cluster associated with the identified network element;

the cluster manager managing a plurality of connection objects corresponding to the number of subscribers in the network;

wherein a connection object comprises a programmatic object that points to a fixed

defined set of templates and contains attributes providing specific substitution

values to be used when instantiating the templates into actual configurations; and

the cluster manager logically re-associating all of the plurality of connection objects of

the specific network element identified as failing with the new network element

selected from the pool of available substitute network elements.